Bubble Experiments

Student Worksheet

Name_____

Overview Bubbles! Everybody loves them, but today you'll experiment with "big kid" bubbles, and discover how they work.

What to Learn After today, you should understand that water has something called surface tension. This force allows you to fill a cup of water past the brim without spilling. Soap is a long molecule that can break this surface tension and cause water to become stretchy.

Materials

- 1 cup liquid dish soap (clear Ivory or green/blue Dawn works best)
- 6 cups COLD water (distilled water is best but cold tap water is ok)
- If you live in a dry area: add 3 tablespoons glycerin (MSDS)
- measuring cup
- large bucket or other container
- bowl
- paper clips
- pepper
- index card or other heavy paper
- pie pan or shallow baking dish
- additives (example: lemon, maple syrup, sugar, corn syrup)
- water or soda bottle
- strawberry basket
- rubber band
- wire coat hanger
- pliers
- straws
- scissors
- 2 wood dowels (about 3 feet long)
- yarn/lace
- hot glue gun
- washer

Lab Time

1. Water tension experiment, part 1:
    a. Put water into a clean bowl
    b. Float a paper clip on the surface. Notice the water bulges up and over the clip!
    c. Put soap on your finger and touch your finger to the surface of the water (not on the paper clip). Observe.
2. Water tension experiment, part 2:
    a. Fill a clean bowl with water.

    b. Sprinkle pepper on top of the water.
    c. Put soap on your finger and touch your finger to the surface of the water. Observe.
3. Make a boat powered by soap:
    a. Make a boat shape out of an index card or other heavy paper.
    b. Cut 2 slits in the back and fold up the inner flap.
    c. Add just enough water to a pie pan so the boat will float.
    d. Once the water is very still, place the boat in the container.
    e. Put soap on your finger, and touch right behind the boat and observe!
    f. Try doing the experiment again without changing the water and observe what happens.
4. Make bubble solution:
    a. Measure 6 cups cold water into a bucket or other container.
    b. Add one cup of dish soap (clear Ivory or green/blue Dawn works best).
    c. Add 3 tablespoons glycerin if you are in a dry area.
    d. Add a few tablespoons of any additive you wish to try (examples: lemon, maple syrup, sugar, corn syrup).
    e. Stir GENTLY with your hands, trying not to form small bubbles (small bubbles will kill the big bubbles). Let bubbles sit while you prepare the next experiment.
5. Trumpet bubbles:
    a. Cut off the bottom of a water or soda bottle.
    b. Wet the cut side with bubble solution.
    c. Blow on the mouth side.
6. Zillions of bubbles:
    a. Dip a strawberry basket into the bubble solution and spin in circles.
7. Weird shapes:
    a. Wrap a rubber band around 2 fingers, and stick it in the bubble solution. When it comes out, you should see a film. Stretch and twist it into weird shapes to see just how stretchy water can be!
8. Mobius bubble: A mobius strip is a ring that has only one side. Can you make a bubble with only one side?
    a. Unwrap a paper clip and make it into a loop with the ends spread apart and not touching.
    b. Dip the clip into the bubble solution. Is there a film?
9. Bubble frames , part 1:
    a. Bend the hook of a wire hanger into a handle.
    b. Bend the rest of the hanger into any shape you wish. A pair of pliers may help!
    c. Dip the hanger into the bubble solution and pull out (note: make sure your hanger will fit into the container you are using).
10. Bubble frames, part 2:
    a. Put 2 straws on a 2-3 foot length of string. Knot the string together and place the knot into one of the straws.
    b. Using the straws as two opposite sides of the frame, dip into the bubble solution and pull out.
11. Polygon shapes:
    a. Cut several straws in half.
    b. Open paper clips until they form an “L” shape.
    c. Insert one side of a paper clip into straw. Insert the other side of the paper clip into a second straw (if the paper clip is too narrow you may pull it apart slightly to make a better fit).
    d. On the end of both straws, insert a paper clip and then connect a final straw between them to make a triangle.

e. To make a 3-D triangle, insert another clip into each corner of the triangle. Insert a straw onto each one. Use a 7th paper clip to connect 2 of the straws at the top, then a final one to connect the last side. Dip in bubble solution to make a triangular bubble.
f. Try to make a cube, or any other 3-D shape you can think of!

12. Bubble castles:
    a. Smear the inside of a shallow pan with bubble solution.
    b. Dip a straw into the bubble solution with the straw touching the bottom of the pan.
    c. Blow! A bubble should form on the pan.
    d. Dip the straw into the solution again. If the straw is soapy enough, you can pierce the bubble and blow another bubble inside (the bubble inside has to exist without touching the outer bubble). How many can you blow? The world record is 7 concentric bubbles!
13. Bubble wand (for GIGANTIC bubbles):
    a. Measure about 8 inches down on a dowel or rod. Use a hot glue gun to attach a piece of yarn to the dowel, then put a line of glue along this 8 inch section. Wrap the yarn around the dowel until it reaches the end. Use fresh glue if it begins to dry before you are finished wrapping.
    b. From end of the dowel, measure 4 feet of yarn and attach with hot glue to the top of a second dowel. Using fresh yarn (NOT the 4 feet you just measured!) and hot glue, wrap 8 inches down the second dowel. When fastened securely with glue, cut the end of the yarn.
    c. Cut a piece of yarn about 18 inches long. Attach this piece securely to the top of each dowel.
    d. Put the whole thing in the bubble solution. Make sure there are no tiny bubbles. Let it soak for a few minutes
    e. Pull straight out, open the loop and see a film form. If there is a light breeze, just stand and let the bubble form. If you want the bubble to float away, bring the two dowels together.
    f. If the bottom loop bunches, add a washer or other weight to the bottom loop.

Bubble Experiments Data Table

Experiment	Observations
Water tension experiment, part 1	
Water tension experiment, part 2	
Boat powered by soap	

Trumpet bubbles	
Zillions of bubbles	
Weird shapes	
Mobius bubble	
Bubble frames, part 1	
Bubble frames, part 2	
Polygon shapes	
Bubble castles	
Bubble wand	

Exercises Answer the questions below:

1. What is surface tension?

2. What was the purpose of the soap in the water tension experiments?

3. Describe the two ends of the snake-like soap molecule. How do these ends work to get things clean?

4. How did the soap-powered boat work?

5. When is the best time to blow bubbles? Why?

Answers to Exercises

1. What is surface tension? (The force that keeps a water droplet in its spherical shape or "sticky").
2. What was the purpose of the soap in the water tension experiments? (The soap broke down the surface tension of the water, which caused the paper clip to fall and the pepper to scoot to the sides.)
3. Describe the two ends of the snake-like soap molecule. How do these ends work to get things clean? (The head of the molecule loves water, and the tail loves dirt. When the molecules come into contact with dirt, the tail wraps around it and holds onto it. The head combines with water, and the whole thing washes down the drain).
4. How did the soap-powered boat work? (The soap broke the surface tension in the water behind the boat. This caused the molecules to stop sticking together and spread out, which pushed the boat. The water at the front was still stick together, which pulled the boat).
5. When is the best time to blow bubbles? Why? (After it rains, because the air is nice and moist. On a hot day, the bubbles start to evaporate too quickly).

Closure Before moving on, ask your students if they have any recommendations or unanswered questions that they can work out on their own. Brainstorming extension ideas is a great way to add more science studies to your class time.